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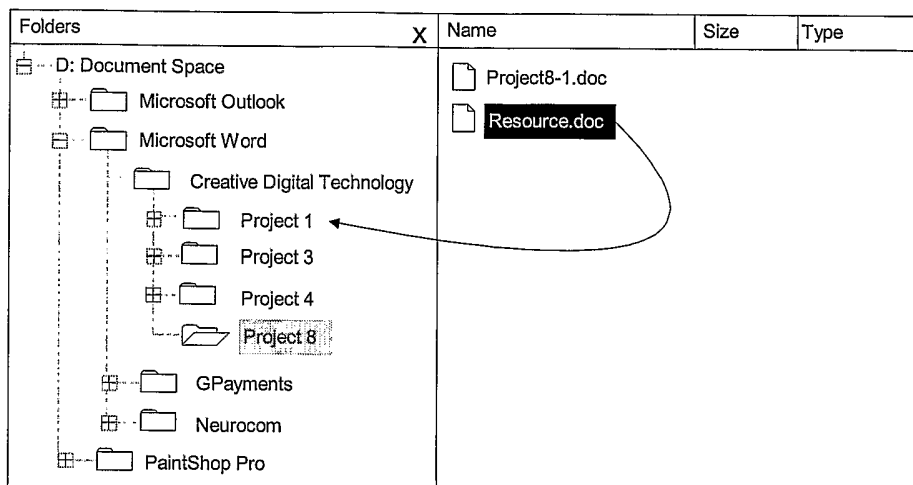
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(54) Title: ATTRIBUTE VALUE INHERITANCE IN FILE DISPLAY SYSTEM



(57) Abstract: A method of displaying one or more file-containing nodes on a display device. The method includes a number of steps. The first step involves displaying one or more files, an origin node and a destination node on the display device, the nodes grouping files according to a nominated attribute, such that those files grouped within the origin node have a nominated attribute with a first value and those files grouped within the destination node have a nominated attribute with a second value. The next step involves receiving an indication, from a user, that a selected file grouped in the origin node should be transferred to the destination node. The next step involves modifying the value of the nominated attribute of the selected file from the first value to the second value. The method also involves displaying, on the display device, the destination node as containing the selected file.

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**TITLE: ATTRIBUTE VALUE INHERITANCE IN FILE DISPLAY SYSTEM****PRIORITY**

This application claims priority from Australian provisional applications 2003900649 entitled "Dynamically Configurable File Display System", 2003901154  
5 entitled "Attribute Value Inheritance in File Display System, and 2003901211 entitled "Application Development Using Virtual Foldering and Metadata Inheritance", all of which are incorporated herein in their entirety by way of reference.

**FIELD OF THE INVENTION**

The present invention relates to the creation of a graphical representation of a  
10 set of files on a microprocessor-based device, such as a mobile phone, a PDA, a music player, a movie player, a networked or stand-alone computer system. More specifically, the invention relates to a file display system in which user-modifiable attribute values of files are automatically inherited when a file is moved into a folder.

The invention has been developed to interact with Microsoft Windows  
15 Explorer, and will largely be described in this document with reference to that specific application. However, it will be appreciated by those skilled in the art that the invention can be embodied in many other forms and devices.

**BACKGROUND**

Any discussion of the prior art throughout the specification should in no way  
20 be considered as an admission that such prior art is widely known or forms part of common general knowledge in the field.

Microprocessor-based devices have long been able to store information in the form of files. Traditionally, the operating system (the software which handles the interface to peripheral hardware, task scheduling, storage allocation and the user-  
25 interface) has been loaded onto computers in the form of a number of elements of data storage known as "files". As a result, the operating system has often been called the "file system."

One task of the file system is to associate information with each file. The term used to describe this information within the computer science field is the "attributes"

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of a file. These attributes are information about the various information storage elements such as files, directories and folders. Examples of file attributes include the file's name, size, type, the time of its creation, the time of its modification and the time its last access. Other attributes include details as to security permissions, revisions number and the like. Many of these attributes are automatically set by the file system and can be referred to as "system-generated" attributes. As a result of the user interacting with these files, system-generated attributes may be automatically created, modified and deleted by the operating system. However, a user is not allowed to change such system-generated attributes.

Other attributes, which we shall refer to as "user-modifiable" attributes can be manually created, modified and deleted by the user. An example of a user-modifiable attribute is the name of a file. The file name can mean something to a user, especially if the file name is used to describe the purpose of the file. The creation and editing of a file will normally involve both system-generated attributes and user-modifiable attributes. For example, when a user creates a new file, they choose a file name. This is a user-modifiable attribute. The user has the ability to change this attribute at any time. When the user creates the new file the operating system simultaneously generates a timestamp attribute called "file creation." The file creation attribute is typical of a system-generated attribute that cannot be changed by the user.

Directories (or folders) also have attributes. The file system associates attributes with directories in a similar way to those attributes associated with files. Similarly, these directory attributes are set automatically by the file system, or manually by the user, using much the same logic as the file attributes that are created, modified and deleted.

One disadvantage of current operating systems is that they do not allow the flexibility to create customisable attributes.

## **SUMMARY OF THE INVENTION**

It is an object of the present invention to overcome or ameliorate at least one of the disadvantages of the prior art, or to provide a useful alternative.

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In order to enable the extension of the current file attributes from those automatically created by the file system there is a need for a software layer between the file system and the representation of files and folders within the user interface level. Preferably, such a software layer would allow the user to create a completely  
5 customisable set of attributes for the files and folders. Preferably also, this abstraction layer would allow a set of user-modifiable attributes (sometimes referred to herein as “metadata”) to be created and which provide customisable information about the data files. By developing such an abstraction layer, the inventors have produced a representation of files within a file system utility which can provide the user with a  
10 view which links their files to their metadata.

According to a first aspect of the present invention there is disclosed a method of displaying one or more file-containing nodes on a display device, the method comprising the steps of: displaying an origin node and a destination node on the display device, the nodes grouping files according to a nominated attribute, such that  
15 those files grouped within the origin node have a nominated attribute with a first value and those files grouped within the destination node have a nominated attribute with a second value; receiving an indication, from a user, that a selected file grouped in the origin node should be transferred to the destination node; modifying the value of the nominated attribute of the selected file from the first value to the second value; and  
20 displaying, on the display device, the destination node as containing the selected file.

Preferably, the step of receiving an indication from a user comprises receiving from a user one or more of the following:

- (a) a drag and drop indication;
- (b) a cut and paste indication; and
- 25 (c) a copy and paste indication; and
- (d) a send to indication.

Preferably, the step of receiving an indication from a user comprises receiving an indication via one or more of the following: (a) a pointing device;

- (a) a keyboard;
- 30 (b) a tablet and stylus arrangement;
- (c) a touch-sensitive screen; and

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(d) a voice-activated device.

Preferably, the files have system-generated attributes and user-modifiable attributes and wherein the nominated attribute is a user-modifiable attribute. Preferably, the step of modifying the value of the nominated attribute of the selected  
5 file from the first value to the second value is performed without simultaneously receiving the second value from the user. Preferably, the values of the nominated attribute are stored externally from the files. Preferably, the values of the nominated attribute are stored in a database. Preferably, the database is adapted to store a plurality of pairs of attributes and attribute values in relation to each file. Preferably,  
10 the origin and destination nodes are displayed as virtual directories or folder, including a label indicative of the value of the nominated attribute of the files in each node.

Preferably, the step of displaying the origin node and the destination node on the display device comprises displaying the nodes in alphabetic, numeric, or alpha-  
15 numeric order in accordance with the nominated attribute and nominated attribute values associated with the respective nodes. Preferably, the step of displaying the origin node and the destination node on the display device comprises displaying the nodes as a tree-based hierarchy of the nodes, in which at least one of the nodes contains other nodes and wherein at least some of the nodes in the hierarchy contain  
20 files associated with an attribute defined in relation to a node higher in the hierarchy. Preferably, each of the nodes at a common hierarchical level beneath a particular node contains files having attribute values corresponding to that associated with the particular node.

Preferably, the step of displaying the origin node and the destination node  
25 comprises: displaying the origin node and the destination node in a first pane; and displaying the files grouped within those nodes in a second pane. Preferably, the step of receiving the indication, from the user, that the selected file grouped in the origin node should be transferred to the destination node comprises:

receiving an indication of the selected file displayed in the second pane;

30 and

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receiving an indication that the selected file should be transferred to the destination node displayed in the first pane.

According to a second aspect of the present invention there is disclosed a computer system for displaying one or more file-containing nodes on a display device, the computer system being adapted to:

- (a) display an origin node and a destination node on a display device, the nodes grouping files according to a nominated attribute, such that those files grouped within the origin node have a nominated attribute with a first value and those files grouped within the destination node have a nominated attribute with a second value;
- (b) receive, via a user interface, an indication from a user that a selected file grouped in the origin node should be transferred to the destination node;
- (c) modify the value of the nominated attribute of the selected file from the first value to the second value; and
- (d) displaying, on the display device, the destination node as containing the selected file.

Preferably, the indication from a user that a selected file grouped in the origin node should be transferred to the destination node is selected from the group comprising:

- (a) a drag and drop indication;
- (b) a cut and paste indication;
- (c) a copy and paste indication; and
- (d) a send to indication.

Preferably, the user interface is selected from the group comprising:

- (a) a pointing device;
- (b) a keyboard;
- (c) a tablet and stylus arrangement;
- (d) a touch-sensitive screen; and
- (e) a voice-activated device.

Preferably, the files have system-generated attributes and user-modifiable attributes and wherein the nominated attribute is a user-modifiable attribute.

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Preferably, the computer system is adapted to modify the value of the nominated attribute of the selected file from the first value to the second value without simultaneously receiving the second value from the user via the user interface.

Preferably, the values of the nominated attribute are stored externally from the files.

5 Preferably, the values of the nominated attribute are stored in a database. Preferably, the database is adapted to store a plurality of pairs of attributes and attribute values in relation to each file.

Preferably, the computer system is adapted to display the origin and destination nodes as virtual directories or folder, including a label indicative of the value of the nominated attribute of the files in each node. Preferably, the computer system is adapted to display the origin node and the destination node on the display device in alphabetic, numeric, or alphanumeric order in accordance with the nominated attribute and nominated attribute values associated with the respective nodes. Preferably, the computer system is adapted to display the origin node and the destination node on the display device as a tree-based hierarchy of the nodes, in which at least one of the nodes contains other nodes and wherein at least some of the nodes in the hierarchy contain files associated with an attribute defined in relation to a node higher in the hierarchy.

Preferably, each of the nodes at a common hierarchical level beneath a particular node contains files having attribute values corresponding to that associated with the particular node. Preferably, the computer system is adapted to display the origin node and the destination node on the display device by: displaying the origin node and the destination node in a first pane of the display device; and displaying the files grouped within those nodes in a second pane of the display device. Preferably, the computer system is adapted to receive the indication, from the user, that the selected file grouped in the origin node should be transferred to the destination node by: receiving an indication of the selected file displayed in the second pane; and receiving an indication that the selected file should be transferred to the destination node displayed in the first pane.

30 According to a third aspect of the present invention there is disclosed a method of displaying one or more file-containing nodes on a display device, the method



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comprising the steps of: displaying an origin node and a destination node on the display device, the nodes grouping files according to a nominated attribute, such that those files grouped within the origin node have a nominated attribute with a first value and those files grouped within the destination node have a nominated attribute with a  
5 second value; receiving an indication, from a user, that the value of the nominated attribute of a selected file grouped in the origin node should be changed from the first value to the second value; modifying the value of the nominated attribute of the selected file from the first value to the second value; and displaying, on the display device, the destination node as containing the selected file.

10 Preferably, the step of receiving an indication from a user that the value of the nominated attribute of the origin node should be changed comprises receiving the second value from the user. Preferably, the step of receiving the second value from the user comprises receiving the second value via one or more of the following:

- (a) a pointing device;
- 15 (b) a keyboard;
- (c) a tablet and stylus arrangement;
- (d) a touch-sensitive screen; and
- (e) a voice-activated device.

Preferably, the files have system-generated attributes and user-modifiable  
20 attributes and wherein the nominated attribute is a user-modifiable attribute. Preferably, the step of modifying the value of the nominated attribute of the selected file from the first value to the second value is performed without simultaneously receiving the second value from the user. Preferably, the values of the nominated attribute are stored externally from the files. Preferably, the values of the nominated  
25 attribute are stored in a database. Preferably, the database is adapted to store a plurality of pairs of attributes and attribute values in relation to each file. Preferably, the origin and destination nodes are displayed as virtual directories or folder, including a label indicative of the value of the nominated attribute of the files in each node.

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According to a fourth aspect of the present invention there is disclosed a computer system for displaying one or more file-containing nodes on a display device, the computer system being adapted to:

- 5 (a) display an origin node and a destination node on a display device, the nodes grouping files according to a nominated attribute, such that those files grouped within the origin node have a nominated attribute with a first value and those files grouped within the destination node have a nominated attribute with a second value;
- (b) receive, via a user interface, an indication from a user that the value of the nominated attribute of a selected file grouped in the origin node should be changed  
10 from the first value to the second value;
- (c) modify the value of the nominated attribute of the selected file from the first value to the second value; and
- (d) displaying, on the display device, the destination node as containing the selected file.

15 Preferably, the computer system is adapted to receive, via a user interface, the indication from a user that the value of the nominated attribute of a selected file grouped in the origin node should be changed from the first value to the second value, by receiving the second value from the user via the user interface. Preferably, the user interface is selected from the group comprising:

- 20 (a) a pointing device;
- (b) a keyboard;
- (c) a tablet and stylus arrangement;
- (d) a touch-sensitive screen; and
- (e) a voice-activated device.

25 Preferably, the files have system-generated attributes and user-modifiable attributes and wherein the nominated attribute is a user-modifiable attribute. Preferably, the computer system is adapted to move the selected file from the origin node to the destination node without simultaneously receiving an indication of the location of the destination node from the user via the user interface. Preferably, the  
30 values of the nominated attribute are stored externally from the files. Preferably, the values of the nominated attribute are stored in a database. Preferably, the database is

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adapted to store a plurality of pairs of attributes and attribute values in relation to each file. Preferably, the computer system is adapted to display the origin and destination nodes as virtual directories or folder, including a label indicative of the value of the nominated attribute of the files in each node.

- 5            Preferably, the computer system comprises one or more of the following:
- (a) a personal computer;
  - (b) a laptop computer;
  - (c) a personal digital assistant (PDA) device;
  - (d) a mobile phone;
  - 10          (e) a tablet and stylus arrangement;
  - (f) a music-playing device; and
  - (g) a movie-playing device.

According to a fifth aspect of the present invention there is disclosed a method of displaying one or more file-containing nodes on a display device, the method  
15          comprising the steps of: displaying a destination node on the display device, the destination node grouping files according to a nominated attribute, such that those files grouped within the destination node have a nominated attribute with a second value; receiving an indication, from a user, that a new file should be placed within the destination node; assigning, to the new file, the second value of the nominated  
20          attribute; and displaying, on the display device, the destination node as containing the new file.

According to a sixth aspect of the present invention there is disclosed a method of displaying one or more file-containing nodes on a display device, the method  
25          comprising the steps of: displaying a destination node on the display device, the destination node grouping files according to a nominated attribute, such that those files grouped within the destination node have a nominated attribute with a second value; receiving an indication, from a user, that a new file should have a nominated attribute with a value equal to the second value; assigning, to the new file, the second value of the nominated attribute; and displaying, on the display device, the destination  
30          node as containing the new file.

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According to a seventh aspect of the present invention there is disclosed a computer program comprising program instructions for causing a computer to perform the method described above.

According to an eighth aspect of the present invention there is disclosed a  
5 computer program comprising program instructions which, when loaded into a computer, constitute the computer system described above. In one form, the computer program is embodied on a record medium. In another form, the computer program is stored in a computer memory. In a further form, the computer program is embodied in a read-only memory. In an additional form, the computer program is carried on an  
10 electrical carrier signal. It will be appreciated from the foregoing that the preferred embodiment of the present invention provides the ability to automatically create, alter and delete values associated with a file's user-modifiable (metadata) attributes.

The preferred embodiment of the present invention allows a user to create a multi-dimensional virtual hierarchy of files based on the selection of metadata.  
15 Preferably, the representation of these files is shown graphically in an interface not dissimilar to applications such as Windows Explorer. The preferred embodiment of this invention provides users with the ability to move files, or the graphical representation of files, within the user interface. Preferably, this movement can be done graphically, by using the drag and drop functionality, or by cutting or copying  
20 the original file from an origin folder and placing the copy into a destination folder. Preferably, when a user creates and displays a graphical representation of a virtual hierarchy within this application, the user can create or alter the values of a file's user-modifiable attributes by moving the representation of the file from one virtual folder to another. Preferably also, by moving the file to another folder, the user-modifiable  
25 attribute values associated with the file are inherited from the values of the virtual folder (or folders) within the hierarchy in which it is placed. In this way, user-modifiable attribute values associated with a file can be automatically created, altered and deleted without the need for the user to provide additional input.

The preferred embodiment of the invention also provides for the metadata  
30 attributes to be defined according to the Resource Definition Framework (RDF) standard model. Preferably, this allows the file metadata attributes to be sufficiently

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flexible in order to enable the creation of the user-defined virtual hierarchy as well as being able to provide a set of standards for defining files within the application level.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

A preferred embodiment of the invention will now be described, by way of  
5 example only, with reference to the accompanying drawings, in which:

Figure 1 is a screenshot showing selection of a file attribute by which to order  
files into nodes;

Figure 2 is a screenshot showing the result of the dynamic folder selection of  
Figure 1;

10 Figure 3 is a screenshot showing selection of a further file attribute;

Figure 4 is screenshot showing the result of the dynamic folder selection of  
Figure 3;

Figure 5 is a screenshot showing a selection step for displaying a file property  
list;

15 Figure 6 is a screenshot showing the file property window showing the  
metadata attributes associated with the selected file;

Figure 7 is a screenshot showing one way in which a file's user-modifiable  
values may be changed;

Figure 8 is a screenshot showing the file in a destination folder as a result of  
20 the change to the user-modifiable value shown in Figure 7;

Figure 9 is a screenshot showing the file no longer in the origin folder as a  
result of the change to the user-modifiable value shown in Figure 7;

Figure 10 is a screenshot showing how a user-modifiable value may be  
changed by dragging and dropping or cutting and pasting a file from an origin folder  
25 to a destination folder;

Figure 11 is a screenshot showing the new location of the selected transferred  
file and a selection of the file's property box;

Figure 12 is a screenshot showing the property box of the selected transferred  
file, illustrating the change to the file's user-modifiable data;

30 Figure 13 is a screenshot showing an initial state of a virtual hierarchy;

Figure 14 is a screenshot showing the way user-modifiable attributes can be  
added and changed; and

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Figure 15 is a screenshot showing the result of the changes made in Figure 14 to the virtual hierarchy shown in Figure 13.

#### **DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS**

The present drawings are simplified partial screen captures of a preferred  
5 embodiment of the invention being operated on an IBM compatible PC running the  
Windows operating system. Such hardware and software are well known to those  
skilled in the art, and so will not be explicitly described in more detail. As shown, the  
preferred form of the invention is applied to Windows Explorer, which is the default  
in-built file management system used in this and previous versions of the Windows  
10 operating system.

It will be appreciated that the words “folder” and “node” are used  
interchangeably within this document, since “folder” is the Microsoft Windows  
nomenclature for such data structures. It will be appreciated that other operating  
system and file management applications may refer to an equivalent structure as a  
15 “directory”, or other terms. It will also be appreciated that although the prior art term  
“folder” is used, it is not intended to imply that the functionality of the system as a  
whole is the same as prior art file display and management applications.

The applicant has also filed co-pending Australian provisional patent  
application number 2003900649 entitled “Dynamically Configurable File Display  
20 System” (the co-pending application), the contents of which are incorporated herein  
by cross-reference.

The functionality of the present invention is, in the preferred embodiment,  
achieved by way of a software application configured to interact with both Windows  
Explorer and the graphical user interface that is used to represent files and folders on a  
25 display of a computer device. The application handles access to the files stored within  
the file system whilst allowing a multi-dimensional graphical representation of files to  
be displayed to the user, as described below. This allows the user to create a  
completely dynamic and customizable representation of files in a virtual hierarchy  
according to the selection of file metadata attributes and their associated values.

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Prior to undertaking the various actions shown in the drawings, it is necessary to generate a file attribute database. This process is described in detail in the co-pending application and will typically be undertaken during installation of the software application of the preferred embodiment. The process involves the software scanning through some or all of the files of interest to a potential user of the system. The precise extent of the scanning can be limited to a default or customizable set of locations or can be limited by file type. For example, in a typical stand-alone computer set-up, there will be no access to remote network drives, so the domain within which files are scanned might be limited to all locally available non-volatile storage, such as hard-disk drives and magneto-optical drives. Alternatively, the scanning can be limited to particular file types, such as various document types, MP3s, MPEGs, and so on. Again, this can be customizable, or can be left at a default setting. During the scanning procedure, various information is extracted from the files being scanned. The type of information will vary from file type to file type, and to the actual information available from a given file. For example, Microsoft Word documents store such information as author, version data and document title, so all such information will usually be sought in relation to Word documents. However, not all Word documents will have, for example, an author recorded against them. In this case, the information is not extracted.

Other document types will have other information. For example, an MP3 will usually incorporate artist name, song title, and various encoding parameters such as bit rate. This information is extracted. For yet other file types, file-relevant information can be extracted. In some cases, file types will be encountered that the application is not familiar with. A number of alternative approaches can be taken in such cases. For example, the file can simply be ignored and the user notified (or not) of its existence. Alternatively, the typical areas within the file for storage of relevant information can be scanned looking for what looks like relevant data. Another approach is to request a human user to fill in details relating to the file, either during installation or at a later date. If the latter, the application can record the file and its location to make it easier to go back and fill in additional details at a later date. Even if the application is unable to obtain application-specific information from any given file, there will still be basic, operating system level information available for all files.

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Under most operating systems, all files have a creation date, a name and an operating system attribute. Such information can be extracted from a file even if the application undertaking the extraction is not familiar with the file type. As it is extracted, the information is stored in a database against the file it is extracted from.

5 Once the extraction process is finished, the database will be populated with a series of file names against which are stored other file data or metadata.

In a preferred embodiment, the database stores file specific data such as file name, size, date of creation and the like. The database also stores pairs of metadata properties and values. For example:

10       FileName=Contract  
          Property=Customer  
          Value=Telstra

This means that if a user is looking for a contract which has Telstra as the relevant customer then the system will display a folder which has been labeled "Telstra." The

15 file contract will be displayed within the "Telstra" folder.

The preferred embodiment of the present invention provides a software layer in which selection of node and metadata attributes cause files to be grouped into virtual folders based on the metadata. Those files having a value for the selected attribute criteria are placed into a virtual folder, dynamically named at the time of

20 creation according to the value of the selected metadata attribute. Those files not having a value for the selected attribute are displayed at the same level as the virtual folder under the original node level, thereby creating a virtual hierarchy.

During the normal life cycle of files within the file system, attributes change. The changing of these attributes may appear to be automatic, as result of the file

25 system altering an attribute value following the running of a process or action. Some file system attributes, such as changing the security or user access to a file, may be altered manually by users. In a similar way, according to the preferred embodiment of the present invention, it is permissible for the metadata attributes of files to be created, modified and deleted. It will be appreciated that the present invention provides an

30 improved way of dynamically presenting files to a user of a computer system.



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A detailed description of the preferred embodiment of the present invention appears below.

Referring to Figure 1, there is shown a two-paned display 100 under Windows Explorer. The left-hand pane 101 shows a folder list headed "Folders", under which is a node called "D: Document Space". This node represents a virtual file structure representing all those files that were scanned as described in previous paragraphs. The right-hand pane 102 shows all files available for viewing under the "Document Space" node. Files with the extension "msg" are e-mail files, "gif" and "jpg" extensions represent image types, whilst a "doc" extension indicates a Microsoft Word document type. In this view, the size and type information that will usually be available is not displayed, although this is of no concern in relation to operation of the invention.

In Figure 1, a user has used a mouse (not shown) to open a selection menu 103, which shows a number of options. The user has selected the "View By" option, which caused a sub-menu 104 to open. The sub-menu displays the available file viewing options. The user has highlighted the "Type" option in the sub-menu 104, and is about to select it by pressing the left-hand mouse button. It will be appreciated that other keyboard-based shortcuts or voice-activated systems could be used to navigate through the menu structure and make the required selection.

The result of making the "Type" selection is shown in Figure 2. Three nodes, named "Microsoft Outlook", "Microsoft Word" and "Paintshop Pro" have been generated and displayed in the left-hand pane as sub-nodes of "Document Space". The "Document Space" node is highlighted, so the right-hand pane displays the three sub-nodes nodes and other files available under that node. In this case, files "Project4.doc" and "Project4.wav" have not been placed under nodes, since there is no publication information stored against them in the database.

In the embodiment shown, the sub-nodes have been ordered alphabetically by default. However, as with normal Windows Explorer functionality, by clicking on column headings (such as "Size" and "Type") it is possible to have the nodes in the right-hand pane reordered accordingly.

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Referring to Figure 3, an alternative selection by the user within the “Microsoft Word” node is shown. Rather than selecting “Type” as the attribute by which to view the files, the user is about to select “Publisher”. It will be noted, in passing, that “Type” in this sub-menu has a small icon beside it that indicates the documents have already been displayed by type. The result of the selection is shown in Figure 4 in which three new nodes, named “Creative Digital Technology”, “GPayments” and “Neurocom”, have been generated and displayed as sub-nodes of the “Microsoft Word node. The “Creative Digital Technology” node is selected, resulting in all files associated with that node being displayed in the right-hand pane. It will be noted that the files in the “Creative Digital Technology” node in this case have already been restricted by file type, so only files that are of a Microsoft Word type and published by Creative Digital Technology have been displayed in the right hand pane.

Turning to Figure 5, a further feature of the software is shown. By right-clicking on any file, a selection menu opens to reveal a number of options. A similar action happens in the prior art, although making certain selections in accordance with the present preferred embodiment results in a new action being performed. In this case, selecting “Properties” of file “Project8-2.doc” results in the window of Figure 6 being displayed, showing the properties of the file. In the prior art, making such a selection would result in file properties stored with the file itself to be displayed. In the present case, however, the attribute values displayed are those stored in the database in relation to the selected file.

In the preferred embodiment, some or all of the attribute values can be amended directly via the window shown in Figure 6, simply by highlighting the attribute and typing in a new value. There may be some restrictions on the attribute to be changed. For example, system level information such as date created might not be amendable. However, the limitations can be selected to suit the security and functionality requirements of the particular user or application to which the invention is being put. It is possible, for example to only display amendable information, or alternatively to display the information but lock it from being edited by an unauthorized user. When the information is amended, the database is updated

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accordingly. Where the amended information is also stored with the file, it particularly preferred that the amendment be recorded at that level too. This is to ensure congruity between the attribute values in the database and those stored at file level. It will be appreciated that information can be added in relation to files by way  
5 of the window of Figure 6.

For example, file "Project8-2.doc" for which metadata is shown in Figure 6 does not appear to have "Identifier" information defined in relation to it. If the user is aware of (or can locate) this information in relation to the file, it can manually be entered by way of the window of Figure 6. The information in relation to this  
10 attribute is then available in future as a user is dynamically customizing the file display.

Figures 7 to 15 illustrate the primary focus of the preferred embodiment of the present invention. Figure 7 shows a user manually modifying the "Publisher" property from an origin node ("Creative Digital Technology") to a destination node  
15 ("GPayments."). Figure 8 shows the result of this manual change to the "Publisher" property. The file, Project8-2.doc now appears in the GPayments node, indicating that the "Publisher" of Project8-2.doc is GPayments. Figure 9 shows the Creative Digital Technology origin node as no longer containing the selected file (Project8-2.doc). In this example a manual change to the user-modifiable properties of a file resulted in its  
20 display in a different node which matched the file's new user-modifiable properties. The reverse arrangement is illustrated in Figures 10 to 12. As shown in Figure 10, a user is able to drag a selected file (Resource.doc) which is currently grouped in origin node Project 8 and drop it into destination node Project 1. This is done using the standard drag and drop function of a mouse, but could also be achieved using the cut  
25 and paste or copy and paste functions. Alternative user interface devices may allow a user to easily transfer files from an origin node to a destination node.

Figure 11 shows the destination node (Project1) now containing the selected file (Resource.doc) as a result of the action illustrated in Figure 10. Figure 11 also shows the user right clicking on the Resource.doc file and selecting its "Properties".  
30 Figure 12 shows the result of that selection. It can be seen in that figure that the user-modifiable attribute "Subject" has been automatically changed from "Project 8" to

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“Project 1” without the user having to manually enter the “Project 1” subject into the system. By simply dragging and dropping a file from an origin node to a destination node, the file has inherited the attributes of the destination node without further manual entry by the user.

5           Figure 13 shows the flexibility of the system in that a user may simultaneously modify a number of attributes of a file, and the system will automatically “move” the file into the appropriate node. As seen in Figure 13, the user has modified the attributes of the file “Resource.doc” so that its “Subject” has been changed from “Project1” to “Project2”, its “Publisher has been changed from “Creative Digital  
10   Technology” to “GPayments”, its “Language” has been changed from a blank field to “en” and its category has been changed from “no category” to “research.”

          Figure 15 shows the result of these manually-made attribute changes. In Figure 15, the file “Resource.doc” now appears within the “research” category node, within the “en” language node, within the “Project2” subject node, within the  
15   “GPayments” publisher node. If the user were to drag and drop the “Resource.doc” file into a completely different node, it would inherit the attributes of that destination node and the user would not have to enter any of those attributes manually. It will also be appreciated that a user may introduce new files into the virtual hierarchy. These new files may be newly created files, or may be files which are obtained from  
20   other sources. When the new files are copied and pasted, or dragged into a particular folder in the virtual hierarchy, those files inherit the attribute values of the particular folder. In this way, new files inherit the attribute values of the destination nodes or folders which they are transferred into.

          In a similar way, manually editing the values of the attributes of a new file will  
25   result in that file being automatically transferred into a folder which groups files having that same attribute value. In this way, new files can be easily introduced into the virtual hierarchy with minimal user input and in such a way that the nodes in which the files are organized do not relate to the location of the file, but instead relate to the attributes of the file. To ensure congruity of information, it is desirable that any  
30   changes to file properties made other than via the display application make their way into the database. Such changes will usually be made by the application programs that

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generate and amend various file types. Amendments can be managed at one level by performing a scheduled update based on information relating to date of last change (which is typically system level data and therefore available for all files).

For example, using Explorer's search tool, the application can determine  
5 whether any files have been amended or created since the time of the last such update. Files falling into this category are scanned for their information and the database updated (if necessary) accordingly. Naturally, such an update could be manually commenced at a time chosen by a user, or automatically when a new application is installed. It is also possible for the application to monitor system-level file  
10 interactions to determine when relevant amendments are made to file attribute values, and database updates made as required. In relation to all of the illustrated and otherwise disclosed examples, it is critical to understand that the nodes that have been generated do not represent locations, as is the case in the prior art Explorer application. Rather, the nodes (or folders) represent virtual data structures that group  
15 files in accordance with common selected attribute values. The various files can be located anywhere on the user's device or PC, or at any location accessible by that device or PC.

For example, some of the Word documents in Figure 5 might be located on a network drive only accessible to the user's computer via a Local Area Network, or  
20 even the Internet. However, the way in which the files are displayed preferably makes no reference to the file location, since in many cases this is not of relevance to a user. Of course, if it is of relevance at some level in the hierarchy, the user is free to generate a new level based on a location attribute, which can be by operating system directory or physical location, for example. However, this is clearly different from  
25 prior art directory structures in which location (or virtual location) is the basis for hierarchy display. It will also be appreciated that in some embodiments, it may be desirable to allow the user to customize the attribute database in some way. Typically, this would involve allowing a user to generate one or more custom attributes that can either automatically or manually have values associated with them in relation to files  
30 of interest. For example, a particular event data could be specified, and Boolean "Before date" attribute defined.

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Preferably, the default and custom attributes are defined in accordance with the Resource Definition Framework (RDF) standard model. This will allow the file metadata attributes to be flexible enough to enable the creation of the user-defined virtual hierarchy, whilst also providing a set of standards for defining files within the application level. It is believed that for many users the ability to dynamically display files hierarchically on the basis of one or more nested attributes will allow easier, more powerful navigation options.

Although the invention has been described with reference to a number of specific embodiments, it will be appreciated by those skilled in the art that the invention can be embodied in many other forms.

**CLAIMS**

1. A method of displaying one or more file-containing nodes on a display device, the method comprising the steps of:
  - displaying an origin node and a destination node on the display device, the
  - 5 nodes grouping files according to a nominated attribute, such that those files grouped within the origin node have a nominated attribute with a first value and those files grouped within the destination node have a nominated attribute with a second value;
  - receiving an indication, from a user, that a selected file grouped in the origin node should be transferred to the destination node;
  - 10 modifying the value of the nominated attribute of the selected file from the first value to the second value; and
  - displaying, on the display device, the destination node as containing the selected file.
2. The method of claim 1 wherein the step of receiving an indication from a user
- 15 comprises receiving from a user one or more of the following:
  - (a) a drag and drop indication;
  - (b) a cut and paste indication;
  - (c) a copy and paste indication; and
  - (d) a send to indication.
- 20 3. The method of claim 2 wherein the step of receiving an indication from a user comprises receiving an indication via one or more of the following:
  - (a) a pointing device;
  - (b) a keyboard;
  - (c) a tablet and stylus arrangement;
  - 25 (d) a touch-sensitive screen; and
  - (e) a voice-activated device.
4. The method of claim 1 wherein the files have system-generated attributes and user-modifiable attributes and wherein the nominated attribute is a user-modifiable attribute.

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5. The method of claim 1 wherein the step of modifying the value of the nominated attribute of the selected file from the first value to the second value is performed without simultaneously receiving the second value from the user.
6. The method of claim 1 wherein the values of the nominated attribute are stored  
5 externally from the files.
7. The method of claim 6 wherein the values of the nominated attribute are stored in a database.
8. The method of claim 7 wherein the database is adapted to store a plurality of pairs of attributes and attribute values in relation to each file.
- 10 9. The method of claim 1, wherein the origin and destination nodes are displayed as virtual directories or folder, including a label indicative of the value of the nominated attribute of the files in each node.
10. The method of claim 1, wherein the step of displaying the origin node and the destination node on the display device comprises displaying the nodes in alphabetic,  
15 numeric, or alpha-numeric order in accordance with the nominated attribute and nominated attribute values associated with the respective nodes.
11. The method of claim 1, wherein the step of displaying the origin node and the destination node on the display device comprises displaying the nodes as a tree-based hierarchy of the nodes, in which at least one of the nodes contains other nodes and  
20 wherein at least some of the nodes in the hierarchy contain files associated with an attribute defined in relation to a node higher in the hierarchy.
12. The method of claim 11, wherein each of the nodes at a common hierarchical level beneath a particular node contains files having attribute values corresponding to that associated with the particular node.
- 25 13. The method of claim 1, wherein the step of displaying the origin node and the destination node comprises:  
displaying the origin node and the destination node in a first pane; and



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displaying the files grouped within those nodes in a second pane.

14. The method of claim 13 wherein the step of receiving the indication, from the user, that the selected file grouped in the origin node should be transferred to the destination node comprises:

- 5 receiving an indication of the selected file displayed in the second pane; and  
receiving an indication that the selected file should be transferred to the destination node displayed in the first pane.

15. A computer system for displaying one or more file-containing nodes on a display device, the computer system being adapted to:

- 10 (a) display an origin node and a destination node on a display device, the nodes grouping files according to a nominated attribute, such that those files grouped within the origin node have a nominated attribute with a first value and those files grouped within the destination node have a nominated attribute with a second value;
- (b) receive, via a user interface, an indication from a user that a selected file  
15 grouped in the origin node should be transferred to the destination node;
- (c) modify the value of the nominated attribute of the selected file from the first value to the second value; and
- (d) displaying, on the display device, the destination node as containing the selected file.

20 16. The system of claim 15 wherein the indication from a user that a selected file grouped in the origin node should be transferred to the destination node is selected from the group comprising:

- (a) a drag and drop indication;
- (b) a cut and paste indication;
- 25 (c) a copy and paste indication; and
- (d) a send to indication

17. The system of claim 15 wherein the user interface is selected from the group comprising:

- (a) a pointing device;
- 30 (b) a keyboard;

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- (c) a tablet and stylus arrangement;
- (d) a touch-sensitive screen; and
- (e) a voice-activated device.

18. The system of claim 15 wherein the files have system-generated attributes and  
5 user-modifiable attributes and wherein the nominated attribute is a user-modifiable  
attribute.
19. The system of claim 15 wherein the computer system is adapted to modify the  
value of the nominated attribute of the selected file from the first value to the second  
value without simultaneously receiving the second value from the user via the user  
10 interface.
20. The system of claim 15 wherein the values of the nominated attribute are  
stored externally from the files.
21. The system of claim 20 wherein the values of the nominated attribute are  
stored in a database.
- 15 22. The system of claim 21 wherein the database is adapted to store a plurality of  
pairs of attributes and attribute values in relation to each file.
23. The system of claim 15, wherein the computer system is adapted to display the  
origin and destination nodes as virtual directories or folder, including a label  
indicative of the value of the nominated attribute of the files in each node.
- 20 24. The system of claim 15, wherein the computer system is adapted to display the  
origin node and the destination node on the display device in alphabetic, numeric, or  
alpha-numeric order in accordance with the nominated attribute and nominated  
attribute values associated with the respective nodes.
25. The system of claim 15, wherein the computer system is adapted to display the  
25 origin node and the destination node on the display device as a tree-based hierarchy of  
the nodes, in which at least one of the nodes contains other nodes and wherein at least  
some of the nodes in the hierarchy contain files associated with an attribute defined in  
relation to a node higher in the hierarchy.

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26. The system of claim 25, wherein each of the nodes at a common hierarchical level beneath a particular node contains files having attribute values corresponding to that associated with the particular node.

27. The system of claim 15, wherein the computer system is adapted to display the  
5 origin node and the destination node on the display device by: displaying the nodes origin node and the destination node in a first pane of the display device; and displaying the files grouped within those nodes in a second pane of the display device.

28. The system of claim 27 wherein the computer system is adapted to receive the indication, from the user, that the selected file grouped in the origin node should be  
10 transferred to the destination node by: receiving the indication of the selected file displayed in the second pane; and receiving the indication that the selected file should be transferred to the destination node displayed in the first pane.

29. A computer program comprising program instructions for causing a computer to perform the method of claim 1.

15 30. A computer program comprising program instructions which, when loaded into a computer, constitute the computer system of claim 15.

31. The computer program of claim 29 or claim 30 embodied on a record medium.

32. The computer program of claim 29 or claim 30 stored in a computer memory.

33. The computer program of claim 29 or claim 30 embodied in a read-only  
20 memory.

34. The computer program of claim 29 or claim 30 carried on an electrical carrier signal.

35. A method of displaying one or more file-containing nodes on a display device, the method comprising the steps of: displaying an origin node and a destination node  
25 on the display device, the nodes grouping files according to a nominated attribute, such that those files grouped within the origin node have a nominated attribute with a first value and those files grouped within the destination node have a nominated

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attribute with a second value; receiving an indication, from a user, that the value of the nominated attribute of a selected file grouped in the origin node should be changed from the first value to the second value; modifying the value of the nominated attribute of the selected file from the first value to the second value; and displaying, on  
5 the display device, the destination node as containing the selected file.

36. The method of claim 35 wherein the step of receiving an indication from a user that the value of the nominated attribute of the origin node should be changed comprises receiving the second value from the user.

37. The method of claim 36 wherein the step of receiving the second value from  
10 the user comprises receiving the second value via one or more of the following:

- (a) a pointing device;
- (b) a keyboard;
- (c) a tablet and stylus arrangement;
- (d) a touch-sensitive screen; and
- 15 (e) a voice-activated device.

38. The method of claim 35 wherein the files have system-generated attributes and user-modifiable attributes and wherein the nominated attribute is a user-modifiable attribute.

39. The method of claim 35 wherein the step of modifying the value of the  
20 nominated attribute of the selected file from the first value to the second value is performed without simultaneously receiving the second value from the user.

40. The method of claim 35 wherein the values of the nominated attribute are stored externally from the files.

41. The method of claim 40 wherein the values of the nominated attribute are  
25 stored in a database.

42. The method of claim 41 wherein the database is adapted to store a plurality of pairs of attributes and attribute values in relation to each file.

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43. The method of claim 35, wherein the origin and destination nodes are displayed as virtual directories or folder, including a label indicative of the value of the nominated attribute of the files in each node.

44. A computer system for displaying one or more file-containing nodes on a display device, the computer system being adapted to:

- (a) display an origin node and a destination node on a display device, the nodes grouping files according to a nominated attribute, such that those files grouped within the origin node have a nominated attribute with a first value and those files grouped within the destination node have a nominated attribute with a second value;
- 10 (b) receive, via a user interface, an indication from a user that the value of the nominated attribute of a selected file grouped in the origin node should be changed from the first value to the second value;
- (c) modify the value of the nominated attribute of the selected file from the first value to the second value; and
- 15 (d) displaying, on the display device, the destination node as containing the selected file.

45. The system of claim 44 wherein computer system is adapted to receive, via a user interface, the indication from a user that the value of the nominated attribute of a selected file grouped in the origin node should be changed from the first value to the second value, by receiving the second value from the user via the user interface.

46. The system of claim 44 wherein the user interface is selected from the group comprising:

- (a) a pointing device;
- (b) a keyboard;
- 25 (c) a tablet and stylus arrangement;
- (d) a touch-sensitive screen; and
- (e) a voice-activated device.

47. The system of claim 44 wherein the files have system-generated attributes and user-modifiable attributes and wherein the nominated attribute is a user-modifiable attribute.

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48. The system of claim 44 wherein the computer system is adapted to move the selected file from the origin node to the destination node without simultaneously receiving an indication of the location of the destination node from the user via the user interface.

5 49. The system of claim 44 wherein the values of the nominated attribute are stored externally from the files.

50. The system of claim 49 wherein the values of the nominated attribute are stored in a database.

51. The system of claim 49 wherein the database is adapted to store a plurality of  
10 pairs of attributes and attribute values in relation to each file.

52. The system of claim 44, wherein the computer system is adapted to display the origin and destination nodes as virtual directories or folder, including a label indicative of the value of the nominated attribute of the files in each node.

53. The system of claim 15 wherein the computer system comprises one or more  
15 of the following:

- (a) a personal computer;
- (b) a laptop computer;
- (c) a personal digital assistant (PDA) device;
- (d) a mobile phone;
- 20 (e) a tablet and stylus arrangement;
- (f) a music-playing device; and
- (g) a movie-playing device.

54. The system of claim 44 wherein the computer system comprises one or more  
of the following:

- 25 (a) a personal computer;
- (b) a laptop computer;
- (c) a personal digital assistant (PDA) device;
- (d) a mobile phone;
- (e) a tablet and stylus arrangement;

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- (f) a music-playing device; and
- (g) a video-playing device.

55. A computer program comprising program instructions for causing a computer to perform the method of claim 35.

5 56. A computer program comprising program instructions which, when loaded into a computer, constitute the computer system of claim 44.

57. The computer program of claim 55 or claim 56 embodied on a record medium.

58. The computer program of claim 55 or claim 56 stored in a computer memory.

59. The computer program of claim 55 or claim 56 embodied in a read-only  
10 memory.

60. The computer program of claim 55 or claim 56 carried on an electrical carrier signal.

61. A method of displaying one or more file-containing nodes on a display device, the method comprising the steps of:

15 displaying a destination node on the display device, the destination node grouping files according to a nominated attribute, such that those files grouped within the destination node have a nominated attribute with a second value;

receiving an indication, from a user, that a new file should be placed within the destination node;

20 assigning, to the new file, the second value of the nominated attribute; and displaying, on the display device, the destination node as containing the new file.

62. A method of displaying one or more file-containing nodes on a display device, the method comprising the steps of:

25 displaying a destination node on the display device, the destination node grouping files according to a nominated attribute, such that those files grouped within the destination node have a nominated attribute with a second value;

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receiving an indication, from a user, that a new file should have a nominated attribute with a value equal to the second value;

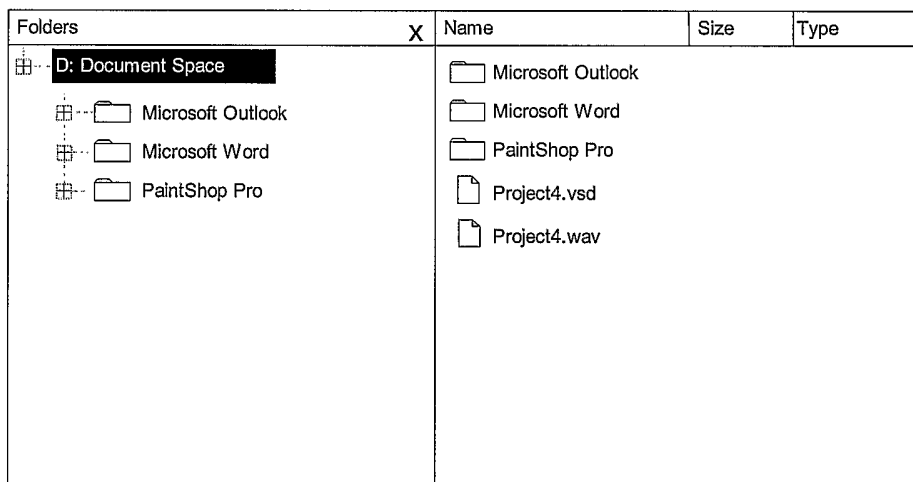
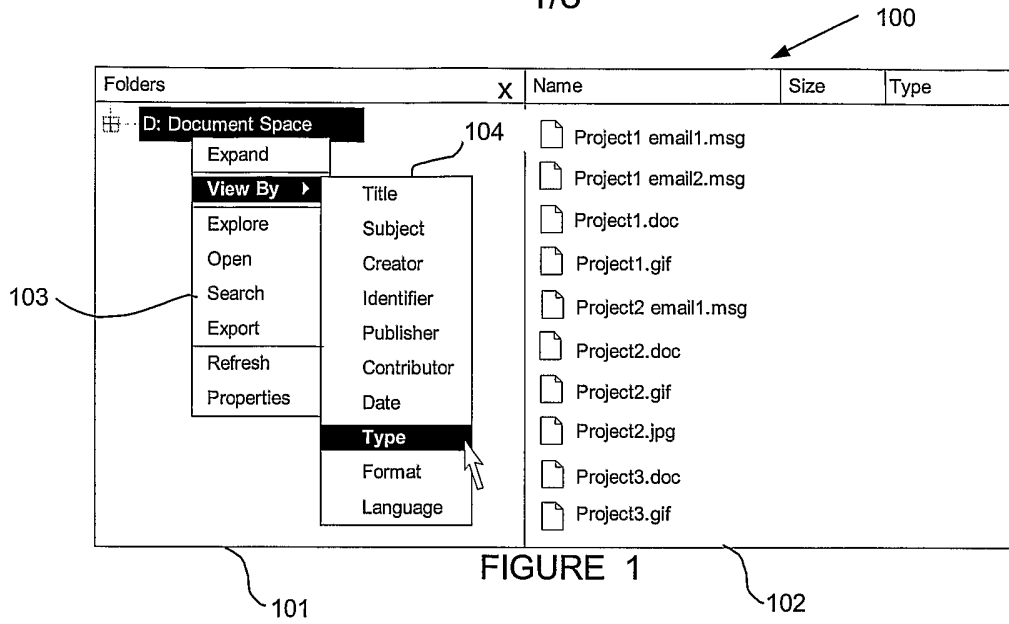
assigning, to the new file, the second value of the nominated attribute; and

displaying, on the display device, the destination node as containing the

5 new file.



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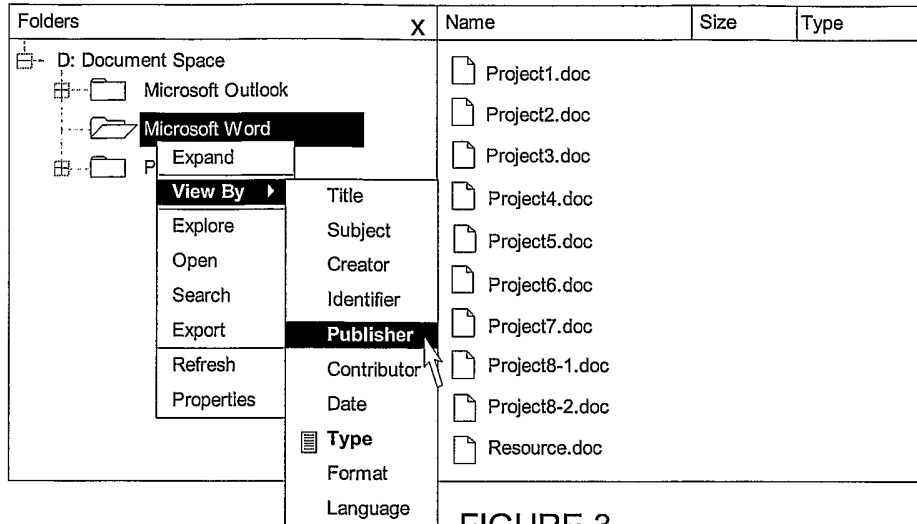


FIGURE 3

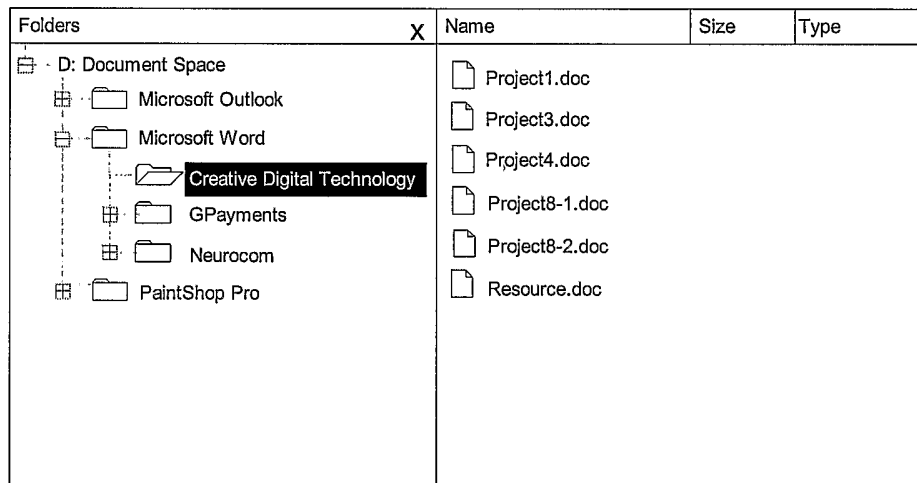


FIGURE 4

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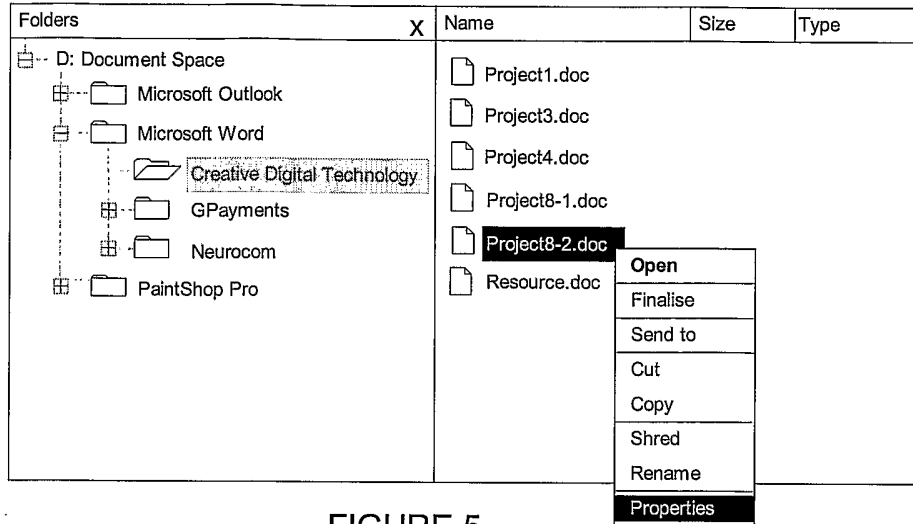


FIGURE 5

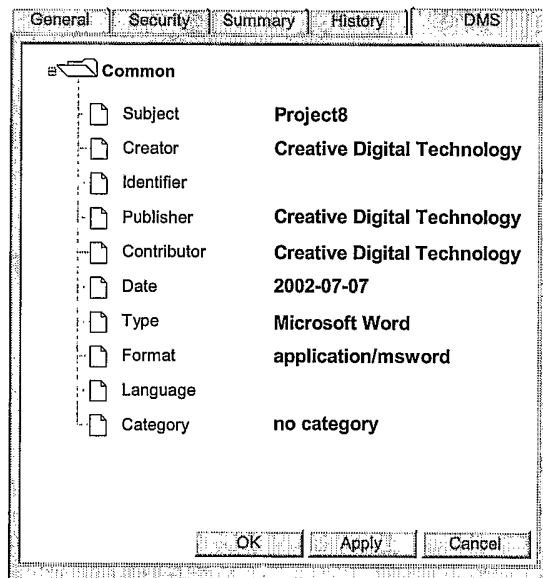


FIGURE 6

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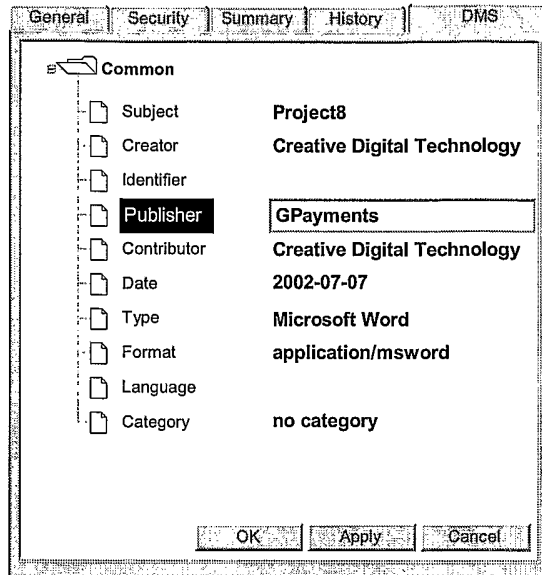
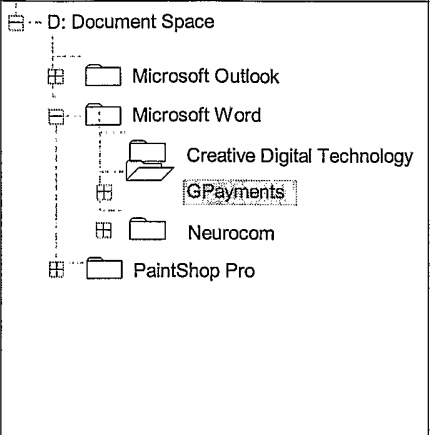


FIGURE 7

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FIGURE 8

Folders	Name	Size	Type
 <p>D: Document Space</p> <ul style="list-style-type: none"><li>Microsoft Outlook</li><li>Microsoft Word<ul style="list-style-type: none"><li>Creative Digital Technology<ul style="list-style-type: none"><li><b>GPayments</b></li></ul></li><li>Neurocom</li></ul></li><li>PaintShop Pro</li></ul>	<ul style="list-style-type: none"><li>Project2.doc</li><li>Project5.doc</li><li>Project6.doc</li><li>Project7.doc</li><li><b>Project8-2.doc</b></li></ul>		

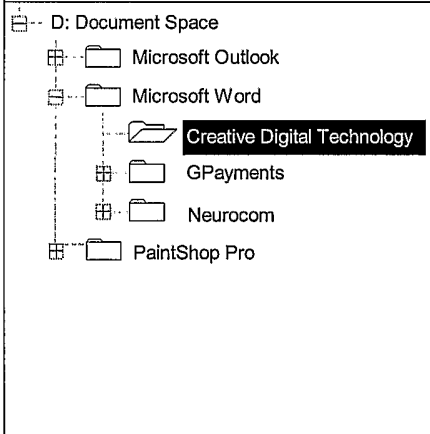
Folders	Name	Size	Type
 <p>D: Document Space</p> <ul style="list-style-type: none"><li>Microsoft Outlook</li><li>Microsoft Word<ul style="list-style-type: none"><li><b>Creative Digital Technology</b></li><li>GPayments</li><li>Neurocom</li></ul></li><li>PaintShop Pro</li></ul>	<ul style="list-style-type: none"><li>Project1.doc</li><li>Project3.doc</li><li>Project4.doc</li><li>Project8-1.doc</li><li>Resource.doc</li></ul>		

FIGURE 9

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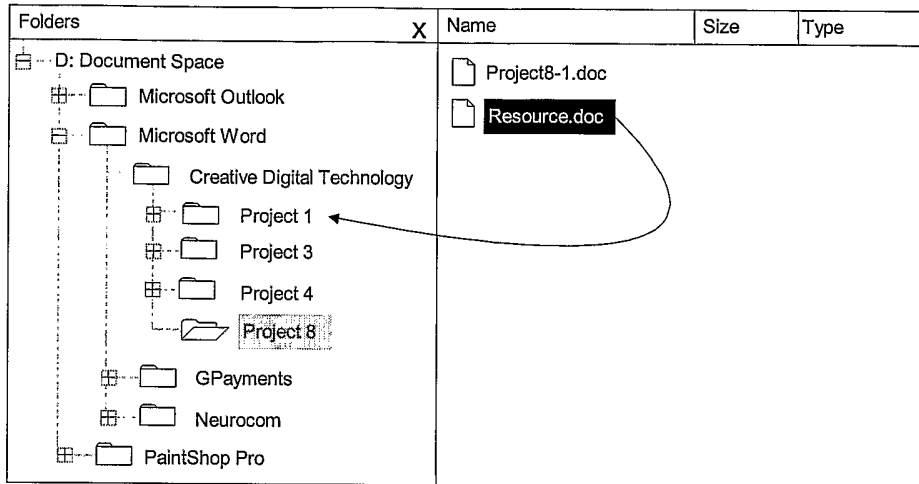


FIGURE 10

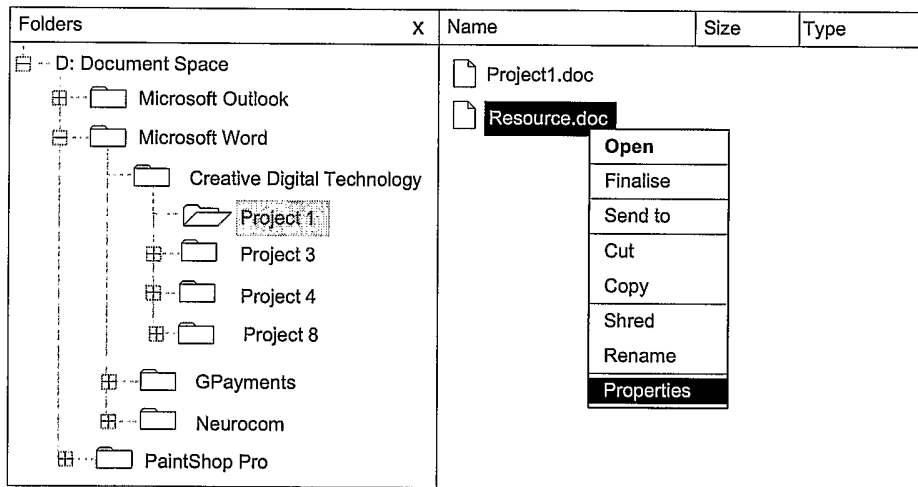


FIGURE 11

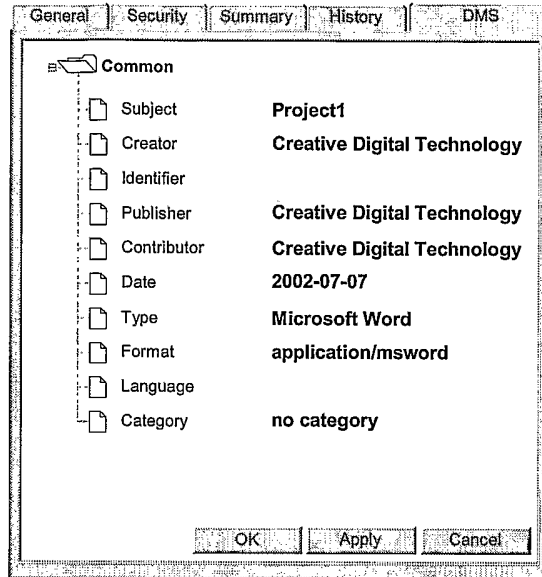


FIGURE 12

Folders	Name	Size	Type
D: Document Space			
Microsoft Outlook			
Microsoft Word			
Creative Digital Technology			
GPayments			
Project 1			
Project 2			
en			
research			
development			
french			
japanese			
	Grants.doc		

FIGURE 13

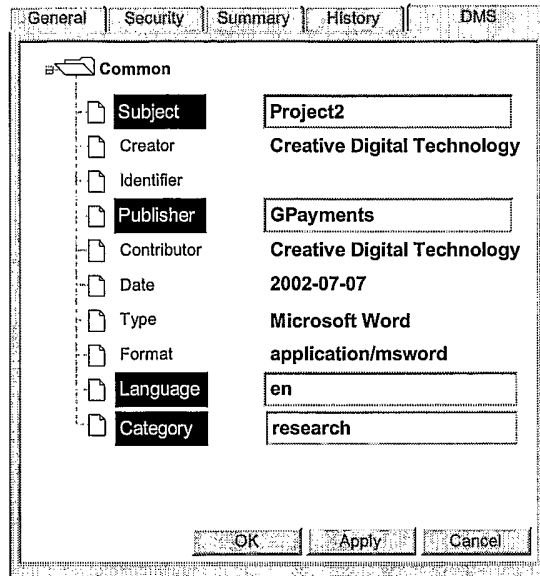


FIGURE 14

Folders	Name	Size	Type
D: Document Space <ul style="list-style-type: none"><li>Microsoft Outlook</li><li>Microsoft Word<ul style="list-style-type: none"><li>Creative Digital Technology</li><li>GPayments<ul style="list-style-type: none"><li>Project 1</li><li>Project 2<ul style="list-style-type: none"><li>en<ul style="list-style-type: none"><li><b>research</b></li><li>development</li></ul></li><li>french</li><li>japanese</li></ul></li></ul></li></ul></li></ul>	Grants.doc Resource.doc		

FIGURE 15



**INTERNATIONAL SEARCH REPORT**

International application No.  
**PCT/AU2004/000173**

**A. CLASSIFICATION OF SUBJECT MATTER**  
Int. Cl. 7: **G06F 17/30**  
According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
**USPTO, DWPI, internet (file, document, folder, directory, hierarchy, attribute, metadata, semantic, property, filter, virtual, namespace, etc.)**

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6,370,538 B1 (LAMPING et al), 9 April 2002 the whole document (in particular, column 7, line 20 – column 11, line 55)	1-62
X	US 6,430,575 B1 (DOURISH et al), 6 August 2002 the whole document	1-62
X	Gifford, D. K. et al, <i>Semantic File Systems</i> 13 <sup>th</sup> ACM Symposium on Operating Systems Principles, October 1991 <a href="http://www.psrq.lcs.mit.edu/history/publications/Papers/sfs.pdf">http://www.psrq.lcs.mit.edu/history/publications/Papers/sfs.pdf</a>	1-62
X	US 2001/0049675 A1 (MANDLER et al), 6 December 2001 the whole document	1-62

Further documents are listed in the continuation of Box C       See patent family annex

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search <b>5 March 2004</b>	Date of mailing of the international search report <b>11 MAR 2004</b>
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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU2004/000173

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Gopal, B. et al, <i>Integrating Content-Based Access Mechanisms with Hierarchical File Systems</i> Proc. 3 <sup>rd</sup> Symposium on Operating Systems Design and Implementation, February 1999	1-62
X	Sechrest, S. et al, <i>Blending Hierarchical and Attribute-Based File Naming</i> Proc. 12 <sup>th</sup> International Conference on Distributed Computer Systems, June 1992	1-62
A	WO 02/069186 A1 (AKODI S.A.), 6 September 2002 the whole document	1-62
A	WO 01/79982 A2 (EMC CORPORATION), 25 October 2001 the whole document	1-62
A	EP 1 003 110 A2 (XEROX CORPORATION), 24 May 2000 the whole document	1-62

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

**PCT/AU2004/000173**

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member			
US	6370538	NONE			
US	6430575	NONE			
US	2001049675	NONE			
WO	02069186	NONE			
WO	0179982	GB	2377354	US	6636250
EP	1003110	JP	2000090076	US	6308179
END OF ANNEX					